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MONTANA FISH HATCHERIES

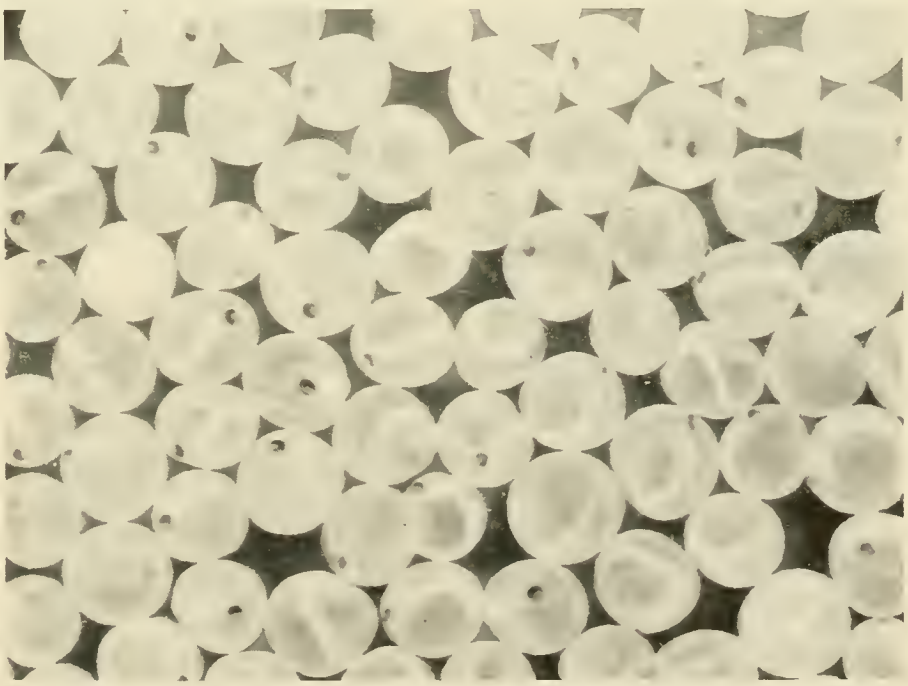
MIRACLE OF THE EGG

The female trout had spent hours working at the stream bottom with her tail and sides flapping against the small rocks and gravel. Gradually, with the help of the stream current, she had scooped from the stream bed a bowl-shaped depression in the clean gravel. Now the male trout that had been standing by moved into the nest beside her. The fish quivered slightly as the eggs were released. Spawning had begun. The female would cover the eggs and in the process clean out another spawning nest or "redd."

Trout eggs, also known as spawn and roe, develop in two clusters within the females. Each spherical, pearl-like eggs is a single, specialized cell which bears within it the miracle of life —the power of duplicating a member of the species from which it originates. A tiny spermatozoon from the milt of the male enters a single egg and fertilizies it. The spermatozoon bears a slender tail to give it mobility, and a head containing the nucleus that carries the male hereditary genes. The instant the male and female nuclei unite, the egg is fertilized. It is now a living, breathing thing. The single cell divides once, then each part divides, then each of those parts divide, and so on. The thousands of divisions form building blocks which are grouped, folded, and molded—eventually into the many different tissues and organs that shape a complete fish.

Spawning

Fish will lay eggs only under certain conditions and other conditions must be met if the eggs are to hatch and young fish survive. Most trout move against the water current when they seek out clean gravel areas in which to spawn. It is believed that fish are able to sense the downward current of water into clean gravel beds and that the ability to detect this movement of water into gravel is a natural and essential instinct in trout finding proper spawning sites. Generally, the female chooses the site and digs the nest while the male remains nearby. There are exceptions. For example, brook trout and kokanee salmon spawn successfully in lake beds where springs keep a fresh supply of water moving over their eggs. Lake trout are perhaps the



Dim outlines and black specks which are bodies and eyes of developing fish can be seen within these trout eggs. The stage at which eyes can be seen in the eggs is called the "eyed stage." Actual egg size—about 3/16″ diameter.

most careless spawners of our trout, spilling their eggs more or less at random over rubblestrewn lakebeds.

Water temperatures play a great deal in determining the time at which fish begin to spawn, but as a rule of thumb, the following schedules can be expected to apply in Montana.

Fall

Kokanee—spawns generally when 4 years old—early December-mid January.

Brown Trout—from October to February.

Lake Trout—around October—eggs adhesive and are broadcast over shelf rock and sharp rubble.

Brook trout—September to November.

Dolly Varden—some activity in September increases through late fall.

Mountain whitefish—late fall—early winter.

Spring

Cutthroat—spring and early summer, usually begins three to six weeks after disappearance of ice.

Rainbow—varies from October to July—probably height in March.

Golden—around early July.

Grayling—March to June.

History of Fish Hatcheries

The first recorded evidence of fish being reared artifically date back to 2100 B.C. in old China. Writings from that period mention laws regulating the time at which fish spawn should be taken. This was spawn which had already been naturally fertilized.

The first account of Europeans culturing fish dates back to the Romans who reared young fish, but apparently did not take spawn. It remained for a German, G. L. Jacobe (1711-1784) to be the first to artificially fertilize fish eggs. The first government sponsored hatchery was built by the French government at Huninque in 1851.

Why Fish Hatcheries?

We have stated that fish lay their eggs only under certain conditions. Trout need a steady flowing, cool, clear stream with a clear gravel bottom. Often, water that is suitable for good trout growth may lack adequate spawning or egg laying sites. When such a situation occurs and natural spawning is not adequate, this production is often taken over by fish hatcheries. The hatcheries provide the various kinds and sizes of fish that certain Montana waters may require.

One day after hatching, young rainbow are mostly yolk sack and eyes. Actual size about 9/16″ long.

Eight days after hatching, young rainbow have begun to absorb yolk sack. Actual size 5/8″-3/4″ long.

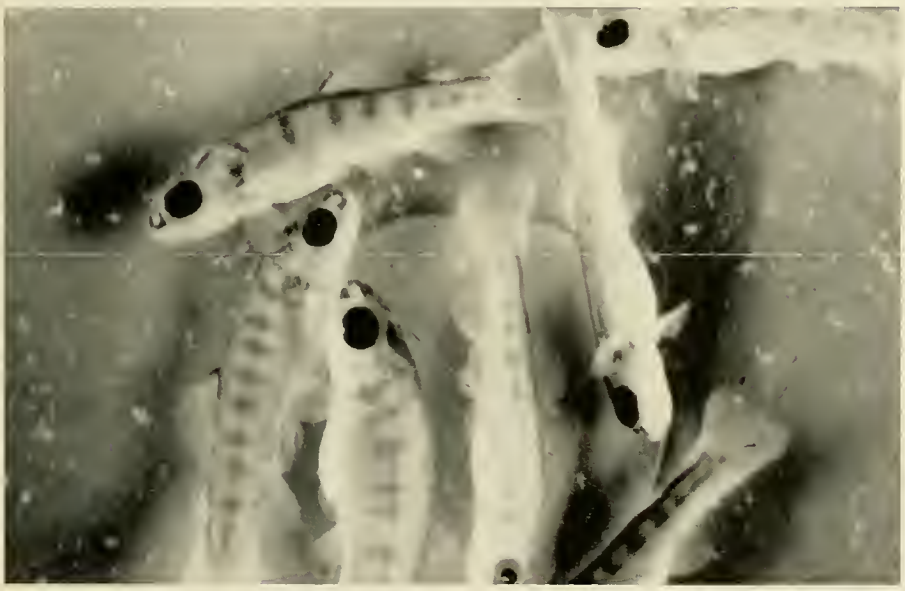
Montana has eight state fish hatcheries. They are at Anaconda, Arlee, Big Timber, Bridger (Bluewater), Great Falls, Lewistown, Libby and Somers. Federal hatcheries are located at Bozeman, Creston, Ennis and Miles City.

What Happens at The Hatchery?

Montana hatcheries raise trout primarily, though some kokanee, coho and grayling are also raised. Warm water fish are raised at the Miles City Federal Fish Hatchery.

The rainbow is the trout most widely cultured and planted. Over the years they have adapated well to fish culture and they are highly praised by the anglers because they are such spectacular fighters. They are also more easily caught than brown trout. Brood stock of rainbow at the Arlee State Fish Hatchery and the Ennis Federal Fish Hatchery provide all of the eggs for state needs. The Arlee brood stock represents fifteen years or selective breeding for such characteristics as resistance to disease, good growth rate, survival, body form, and color. The Arlee fish are held in one of the

Fifteen days after hatching, first food was given to these rainbow. Yolk is about gone from most. Actual size—about 3/4" long.



Twenty two days after hatching, the young trout show parr marks, dark areas of pigment typical of young salmonid fishes. Actual size—3/4" to 1" long.

most modern spawning facilities. An outline of fish rearing at Arlee will serve as a guide to fish culture in the state.

In the spring, the ripe fish, those that are ready to spawn, are moved into a raceway that leads into a spawning house. Here an automatic crowder, electrically operated, moves the fish into the spawning house as they are needed. Once inside, the fish are raised on a screen lift within easy reach of the spawn-takers. The spawn-takers gently press the eggs from the fish into a container. The eggs are fertilized when milt or sperm from a male rainbow is poured over the eggs. The milt is obtained from males in much the same manner as eggs are taken from the female. The milt from one male is usually used to fertilize the eggs from three or four females.

Egg Development

The fertilized eggs are washed and then placed in hatching boxes, jars, or baskets. The eggs have a continuous supply of clean, cool, well-aerated water flowing over them.

At Arlee, the eggs eye up in about two weeks. "Eye up" means the egg has developed to the point where the eyes of the fish—two small black specks can be seen. Prior to the eyed stage, the eggs are extremely tender, and can be killed even by light movement or jarring. The eyed eggs can withstand fairly rough handling, and it is at this stage that they are handled and shipped to other hatcheries.

Some of the eggs are kept at Arlee to complete their hatching. Others go to Anaconda, Bluewater (Bridger), Great Falls, and Lewistown. The water temperature determines the rate of egg development. Rainbow eggs hatch in about 30 days at 50 degree F., and in 61 days at 43 degrees F.

Young Trout

Newly hatched trout are called sac fry. Sac fry have the yolk sac still attached to their bellies. These young trout lie upon the bottom and use up the yolk in the sac for food while they develop further. When they are able to swim up and search for food they are called swim-up fry.

The swim-up fry are fed tiny granules of food as they start to feed. The fish grow quite rapidly and as they increase in size they are called fingerlings. Fingerlings are fed correspondingly larger pellets.

Trout Diet

The modern pelleted fish foods supply complete nutrition for the fish. The pelleted foods produce about a pound of fish for every one and one-half to two pounds of pellets fed. The pellets have replaced the liver and ground meat diets fed to fish several years ago. The old meat diets were more costly than pellets, harder to handle and store, and produced only a pound of fish for every five or six pounds of ground meat fed. Fish fed the modern balanced diet are in far better condition when planted than fish fed the old ground meat diet.

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Trout Diseases

Diseases of fish, both external and internal, have been a problem at fish hatcheries since hatcheries began. Fish are crowded together in large numbers and the transmission of disease becomes much easier than it would be in the wild. The old saying that "an ounce of prevention is worth a pound of cure" fits the hatchery problem extremely well. Prevention is accomplished through keeping the hatchery scrupulously clean and disinfecting frequently those areas where bacteria might tend to develop. The Montana hatchery system has been very fortunate, over the years, in the low incidence of any serious diseases at its various stations. Modern, proven drugs have been of immeasurable value in the control of fish diseases, much as they have in the control of human diseases.

How is it determined if stocking is needed?

Fisheries biologists constantly check state waters. A large share of the waters in the state produce, on their own, large crops of fish each year. If fishing is not good, the fisheries biologist attempts to find out why and to correct the situation.

Usually the best way to improve fishing is to improve the quality of the water in which the fish must live. Fishing water comes from snow and rain which falls on the land or watershed and then gathers into streams. In most cases the best way to improve the quality of the water is to keep the land and its vegetative cover in good condition so a lot of soil doesn't wash into streams. Chemical and sewage pollution can also make water unfit for fish life. If fish survive at all in polluted waters, they are usually the unwanted carp or suckers.

Stream straightening removes brush and other fish cover, makes water flow faster and results in fewer fish in a stream. So, to improve water quality for fish, important factors are: prevention or correction of pollution (including silt), prevention of stream straightening and other alteration, control of erosion, and maintenance of good cover not only along streams, but on the entire watershed.

The fisheries biologist checks the condition of the water, testing for pollution, alkalinity or acidity, fish food production, temperature, and oxygen content. He uses a electro-shockers or nets to sample the fish which may be present to find out what species they are, and what condition the fish are in. He checks fishermen to determine the quality of the fishing. All these factors and more go into making fish management decisions.

Where do hatchery fish fit into the picture?

Hatchery fish are used mainly: to stock new, unpopulated waters, to supplement fish in water where there is inadequate natural fish reproduction, to supplement natural populations in heavily fished waters, to maintain fish populations in suitable waters having no natural reproduction, and to restock waters from which game and trash fish have been eliminated.

One can see that these occasions for stocking all center around one thing—the desirability for more fish than can be produced naturally in a given area. Water that is easily accessible and which receives heavy fishing pressure may require periodic stocking. Waters which are not readily accessible and which do not receive heavy fishing pressure often have sufficient natural reproduction.

What Kind of Fish Are Stocked?

The kind of fish stocked depends largely on the quality of the water where they are to be stocked. Grayling go into high quality waters that have few or no fish competitive to the grayling. Rainbow, brook, and brown trout go into other high quality waters throughout the state. Kokanee, Coho salmon (silver salmon) and lake trout go into large deep lakes or reservoirs that stay cool yearround. Cutthroat trout are placed in certain high quality streams and lakes. Bass, bluegill, northern pike, and walleye pike are planted in waters that may be somewhat warmer during the summer than does trout water. Catfish go into waters that are more muddy.

Planting Size of Fish

Fish are planted at different ages for different reasons. Ones up to about two inches are called fry. They can be described as "two eyes and a wiggle." They are used to stock areas where there is little competition and few predators. Fingerlings are fish that measure from about two to five inches They are used to stock areas lacking natural reproduction of their own species. These areas, usually lakes or reservoirs, may have fish that would eat the tiny fry, but could not catch many of the fingerlings. Catchables are fish over seven inches. They are used to supplement natural reproduction in streams. Also catchables are used to stock waters where fish cannot live over winter but do provide seasonal fishing.

Planting Fish

Fish for planting are transported by truck, airplane, helicopter, boat and pack horse. Usually they are carried in tanks into which oxygen is bubbled to keep the water fresh. When the planting site is reached, the temperature of the water in the fish tank is made equal to the temperature of the water in which the fish are to be planted. To equalize the temperature, water from the lake or stream is slowly pumped into the fish tank. Equalizing the temperature prevents fish loss due to sudden temperature change.

SOME SPECIAL CASES

Grayling

In Montana, grayling have disappeared from most of the waters in which they were once plentiful. This has been caused in some areas by changes in their environment, such as increases in silt and other pollutant. To an even greater extent, it is also due to man's rather indiscriminate planting of various species of fish into grayling water. Grayling simply cannot withstand Competition, and have largely disappeared. However, they still enjoy a limited but firm foothold in several lakes in the state. Fish culture plays an important role in the maintenance of Montana grayling. The state fish hatchery at Somers takes grayling eggs each spring from the brood stock established at Rogers Lake. Recently the federal hatchery at Bozeman successfully took and hatched eggs from grayling brood stock held at that station.

Cutthroat Trout

Montana raises two distinct strains of cutthroat or native trout: the Yellowstone and the westslope. The Yellowstone is reared at Big Timber hatchery from brood stock held there. The westslope is raised from stocks at Libby, Somers, and Creston.

Brook trout often spawn successfully in tiny brooks where other trout are unable to reproduce.

While the Yellowstone cutthroat has been raised in fish hatcheries for many years, production of the westslope strain is just now developing. It has taken considerable time and testing to determine that the fish now in the hatchery are the same kind of stock as those fish found in the upper reaches of the Flathead River drainage. Almost all of the westslope cutthroat production goes into the Flathead drainage.

Brook Trout

Brook trout normally do a good job of maintaining their numbers through natural reproduction. They are fall spawners. In cold waters at the higher elevations, brook trout often mature and spawn when only four or five inches in length. Competition for food may then hold them at this small size throughout their lives.

Sometimes a lake or series of beaver ponds where brook trout would thrive lack spawning sites. The flowing water or the gravel bottom needed for natural reproduction may be missing. In these instances, the Great Falls hatchery makes up for this lack of reproduction by hatching brook trout for stocking. They are usually stocked at fingerling size—two to five inches.

Brown Trout

Brown trout are fall spawners and most spawning occurs from October to December. In Montana, browns are raised only when needed for introductions into waters where they have not been present or where something may have caused their removal; for example, dewatering or rehabilitation. They have been raised at the Big Timber Hatchery and should they be needed again this is probably where they would be raised. Once established, browns reproduce well and repeated stockings are not necessary.

Kokoanee

Kokanee, also called landlocked sockeye salmon, spawn in their fourth year and die—a characteristic of all Pacific salmon. As spawning time approaches in the Flathead Lake area, the crew from the Somers Hatchery keeps checking kokanee runs. When the fish are ripe, the crew corrals large numbers with seines and takes the desired number of eggs. The eggs are then hatched under controlled conditions at the Somers hatchery.

THE GOOD OLD DAYS

It's a little frightening how nostalgia and forgetfulness can team up to make us lament for the "good old days." You can bet that the old timer who dreams misty-eyed of bygone days lives in the reverie of lost friends and green years. Odds are that he forgets beating a path to the out-house at 20 degrees below zero, lighting the oil lamp, or driving the ruts of main roads. We are all prone to remember the good and to forget the bad, and hunters are no exception.

The hunter who lives in the glory of "good old days" is probably thinking back further than most of us can remember, or he is recalling the top-heavy deer populations of the late 1940's and early 1950's when deer were thick as ants on an anthill, could be easily hunted by car, and incidentally were eating their winter ranges into the dirt. If he remembers game conditions as they were during the late 1800's and early 1900's, then he would remember when game was at an all time low. He would remember that by 1915, many persons believed that antelope were doomed to extinction. He would remember that in 1910 the best authenticated records showed only 200 to 300 elk in the entire Sun River area. He would remember that in 1905-1906 hunters could pack a full month through the wildest part of the southfork of the Flathead and the Sun River country without seeing more than one or two big game animals. He would remember too that there were far fewer elk herds, fewer sheep herds, fewer goat herds, and no turkeys. These are the good old days which are too often forgotten.

A conspiracy of natural and planned events brought game back to abundance—some almost from the brink of disaster. Trapping and transplanting programs were part of the management plan which has seen elk, antelope, sheep, and goats established in many new areas around the state, or reestablished in old ones. The trapping of elk began in 1910, and since that time almost 7,000 elk have been delivered about the state. Montana has probably trapped and transplanted more elk than all of the other states combined. Antelope transplanting began in 1946, mountain sheep in 1942, and goats in 1941.

Old time market hunters were blamed for game depletion in many areas, but changing land uses had more profound and longer lasting influences on game.

Trapping and transplanting alone cannot be credited with the comeback of game. Of more importance were the things which were happening to the land and vegetation. Huge, rampaging fires swept through western Montana forests and opened up vast areas to sunlight. The opportunists, weeds and shrubs, ever ready to invade such areas took root and produced thousands of acres of lush new deer and elk range. Cutting of timber too, for railroad ties, buildings, telephone poles, mine timbers, and a myriad of other uses was at a fever pitch and also helped to open up holes in mature forest areas. Homesteaders hacked at the timber, cleared their "forty's" turned some virgin sod, and unknowingly created what is known as "edge effect," prime wildlife habitat. Many homesteads were soon abandoned, leaving the land again to a succession of forbs and shrubs. In the plains, overgrazing favored the growth of weeds—important deer and antelope foods. Better law enforcement, control of predators, setting of bag limits, and many other factors all added their bit to the overall picture. The gross effect was an explosive growth in game populations, the likes of which we'll never see again.

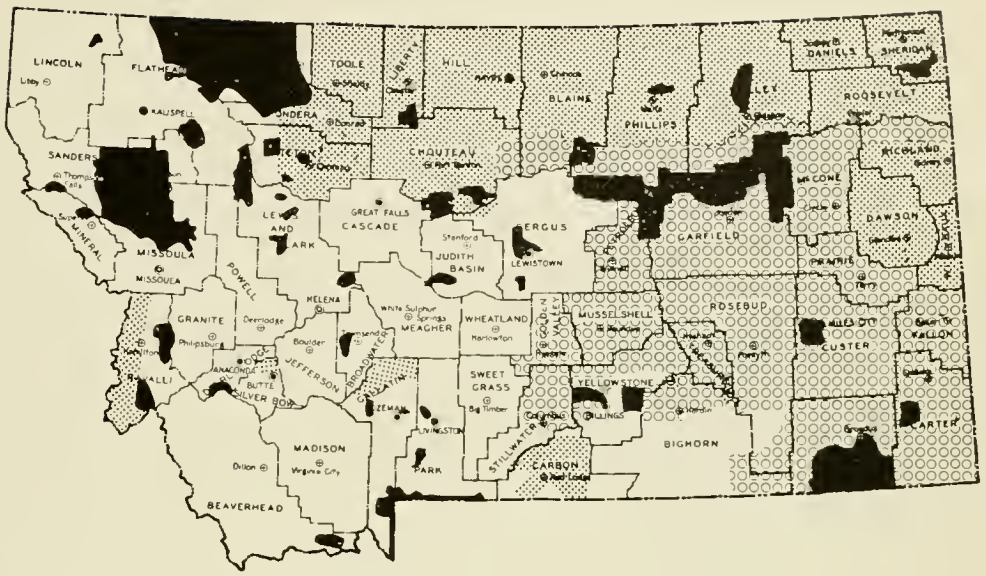
The swinging pendulum of nature suspended almost motionless for an instant at the end of its upward production stroke. Then it started downward again. The top-heavy animal populations outstripped their food supplies. The succession of plants, one type replacing another, marched on and the shrubs on old burns and cut over areas once more gave way grudgingly to the taller forest trees. Game numbers, especially deer and elk, began to shrink with the disappearnce of abundant food. Too often, important food producing areas were severely damaged by too much use. On a large scale, the shrinking deer and elk numbers was rather gradual, but elsewhere winter and starvation cut dramatic swaths through game herds. Many sportsmen were quick to blame more liberal hunting seasons and larger hunter harvests for the diminishing numbers.

Game workers knew and many sportsmen conceded that something had to be done in order to better manage game. The methods of control were either sex seasons, special non-resident licenses for certain areas, and more liberal bag

limits. In most areas of the state, deer and antelope have been brought down to levels which are more compatible with their habitat. Still, many hunters decry the lessening of the game numbers and complain because they have to hunt a little harder. In 1958, a game worker wrote the following in one of the Fish and Game Department's official publications: "The fact that deer populations are decreasing in mountainous areas will be viewed with alarm by some individuals. It will seem illogical to others that a shortage of winter food rather than harvests is the reason for this decline." Among other predictions were these: "Deer populations in the state's mountainous areas will continue to decrease as a result of food shortages and competition with elk. Coincident with deer decreases and increases in numbers of hunters, the success of big game license holders will decline. In-

BIG GAME REGULATIONS - 1947-48

MONTANA.

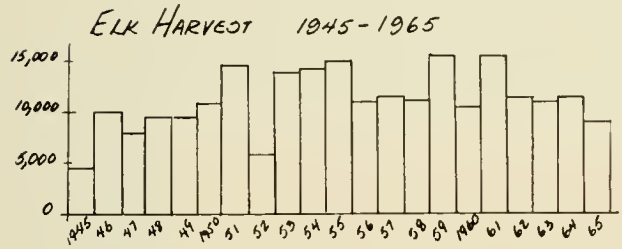


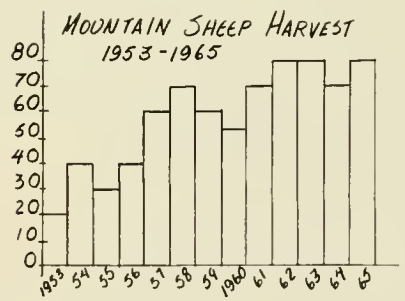
DEER

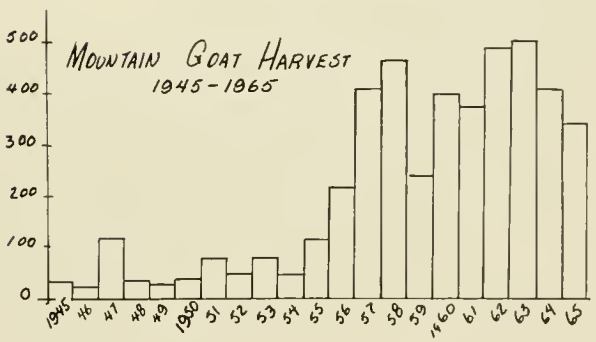
- CLOSED TO HUNTING OF ALL BIG GAME
- CLOSED TO DEER HUNTING
- SPECIAL DEER SEASON
  Regular season Oct. 15 - Nov. 15 - 1 male deer with antlers not less than 4" above the head.

Hunter maps and regulations from 20 years past show that today's sportsmen have greater hunting opportunities.

Several years of game harvest figures show that hunters are making better use of the resource. Periodic ups and downs can be expected, but harvests have tended to more or less level off.



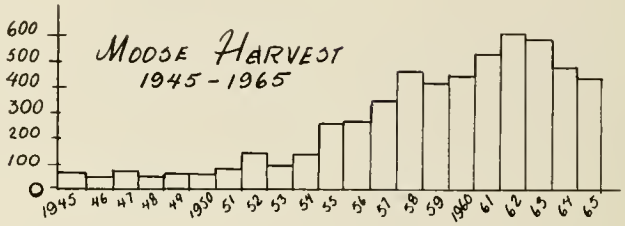




stead of 77 deer being harvested for every 100 license holders, as in recent years, we would expect about 40 or 50 for every 100 in the future. With lower deer populations, hunting will be more sporting. Individuals who hunt from cars or do not get any distance from roads will be largely unsuccessful. Those who expend the effort will get deer, but there may be times even when the best hunter is unsuccessful. . ."

With the modern methods of fire spotting and fire fighting, we no longer expect fires to run rampant and reopen new game areas as they once did. Neither can we expect more homesteading, or turning back to plant production the thousands of acres under asphalt, concrete, reservoirs, and railroad beds. Still, many persons insist that big game should be as plentiful as they were when conditions were most in their favor.

Montanans had an excellent year in 1966 for hunting on nearly all fronts. Even though the pressure of civilization continues to make itself felt, hunting opportunities in Montana are exceptional. Though we don't, and can't have deer in the numbers that they once were, game management has made it possible for Montanans to enjoy big game hunting that is head and shoulders over that found in "the good old days," and the envy of other states.



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